United States Environmental Protection Agency

Enforcement and Compliance Assurance (2201)

EPA 520-F-96-001
Fall 1995

EPA

Superfund At Work

Hazardous Waste Cleanup Efforts Nationwide

Montclair/West Orange and Glen Ridge Radium Site Profile

Site Description:
Residential properties in Essex County, New Jersey

Site Size: 210 acres

Primary Contaminants:
Radium, radon decay products, gamma radiation

Potential Range of Health Effects:
Increased risk of cancer, genetic disorders, birth defects

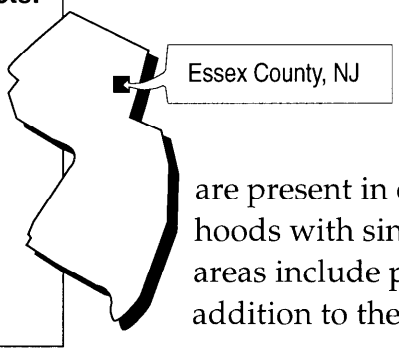
Nearby Population Affected:
32,000 people within one mile

Year Listed on NPL: 1985

EPA Region: 2

EPA Works with Homeowners to Reduce Radium Exposure

The Montclair/West Orange and Glen Ridge Radium sites consist of three non-contiguous, radium-contaminated areas of suburban Essex County, New Jersey. The two Superfund sites cover approximately 210 acres and include 769 properties. Some of the soil at the sites is contaminated to varying degrees with radioactive waste materials suspected to have originated from radium processing or utilization facilities which were located nearby in the early 1900s. Waste materials similar to uranium mill tailings were disposed of in previously rural areas of the communities.



Houses were subsequently constructed on or near these radium waste disposal areas. The contaminated areas in Montclair, West Orange, and Glen Ridge are present in older, well-established residential neighborhoods with single and two-family homes. The three study areas include public areas such as streets and parks in addition to the residential properties. This site is an example of how innovative technology, sound management, and effective community relations can work together for efficient, effective, and affordable environmental cleanup. To date, the Montclair/West Orange and Glen Ridge Radium sites are the largest residential cleanup in the country. With potentially responsible parties out of business for almost 70 years, very little work could have taken place without the Superfund program.

Urban development completely covers this once rural area. *(Compare with photos on pages 3 and 5.)*

Health Effects

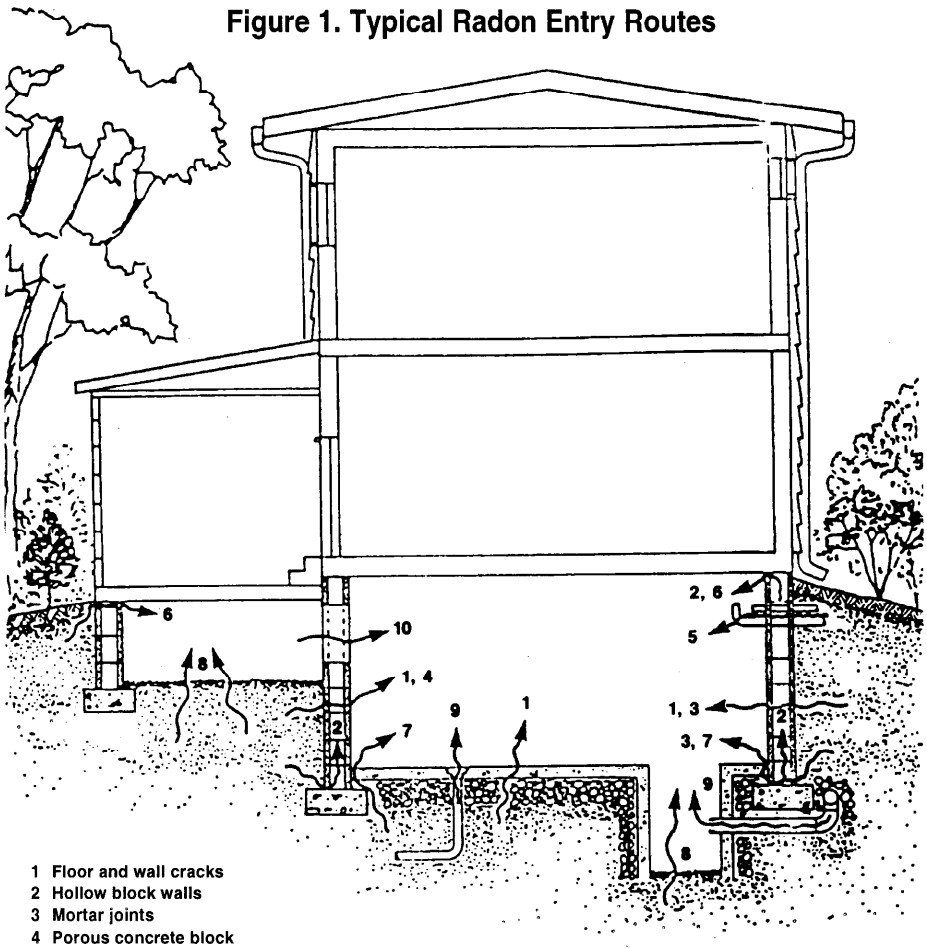
Radioactive waste materials, suspected to have originated from radium processing or utilization facilities, were disposed of in rural areas of the communities. Soil on public and private properties within the sites is contaminated with radionuclides which are primarily those in the uranium decay chain. Hence, the main radionuclide of concern is radium. The radioactive decay of nuclides in the soil causes elevated indoor concentrations of radon gas and radon decay products in some houses, while others additionally exhibit elevated levels of indoor and/or outdoor gamma radiation. A number of properties have only elevated levels of gamma radiation. Radon gas and gamma radiation pose different types of radiation threats and therefore require different control techniques.

As a gas, radon can easily move through the soil to the ground surface or into houses (see typical radon entry routes in Figure 1). While radon gas is quickly dissipated in the outdoor air, as it decays inside a house, the concentration of radon decay products in the indoor air increases. Scientific studies of uranium miners have shown conclusively that prolonged inhalation of air containing high concentrations of radon decay products causes an increase in the probability of the occurrence of lung cancer.

While long-term exposure to indoor radon gas and radon decay products presents the greatest single health risk at the sites, other pathways of exposure are not insignificant. The radioactive decay of radium results in the emission of highly penetrating gamma radiation. Gamma radiation is of concern because it may give an irradiation over the whole body. The greater the duration or intensity of the exposure, the larger the dose, and therefore, the greater the risk of adverse health effects such as cancer, genetic disorders, and birth defects.

In addition, because airborne particulate matter (e.g., windblown dust or soil) may contain small concentrations of radium, inhalation of radium is a possibility at the sites. Inadvertent ingestion of radium-contaminated soil is another pathway that can result in doses to various internal bodily organs and can result in an increased risk of developing leukemia, anemia, and bone cancer. Studies have shown, however, that the projected radiation doses from these pathways are much smaller than those estimated for either radon decay product inhalation or direct gamma radiation exposure using even the most conservative assumptions.

Figure 1. Typical Radon Entry Routes



1 Floor and wall cracks
2 Hollow block walls
3 Mortar joints
4 Porous concrete block
5 Holes for utility and service pipes, cables, etc.
6 Sill plate and header joist gaps
7 Slab – footing joints
8 Exposed soil
9 Drains, sumps and weeping (drain) tiles
10 Crawl spaces

Not to Scale

Adapted from Radon Reduction Techniques for Detached Houses; Technical Guidance, USEPA

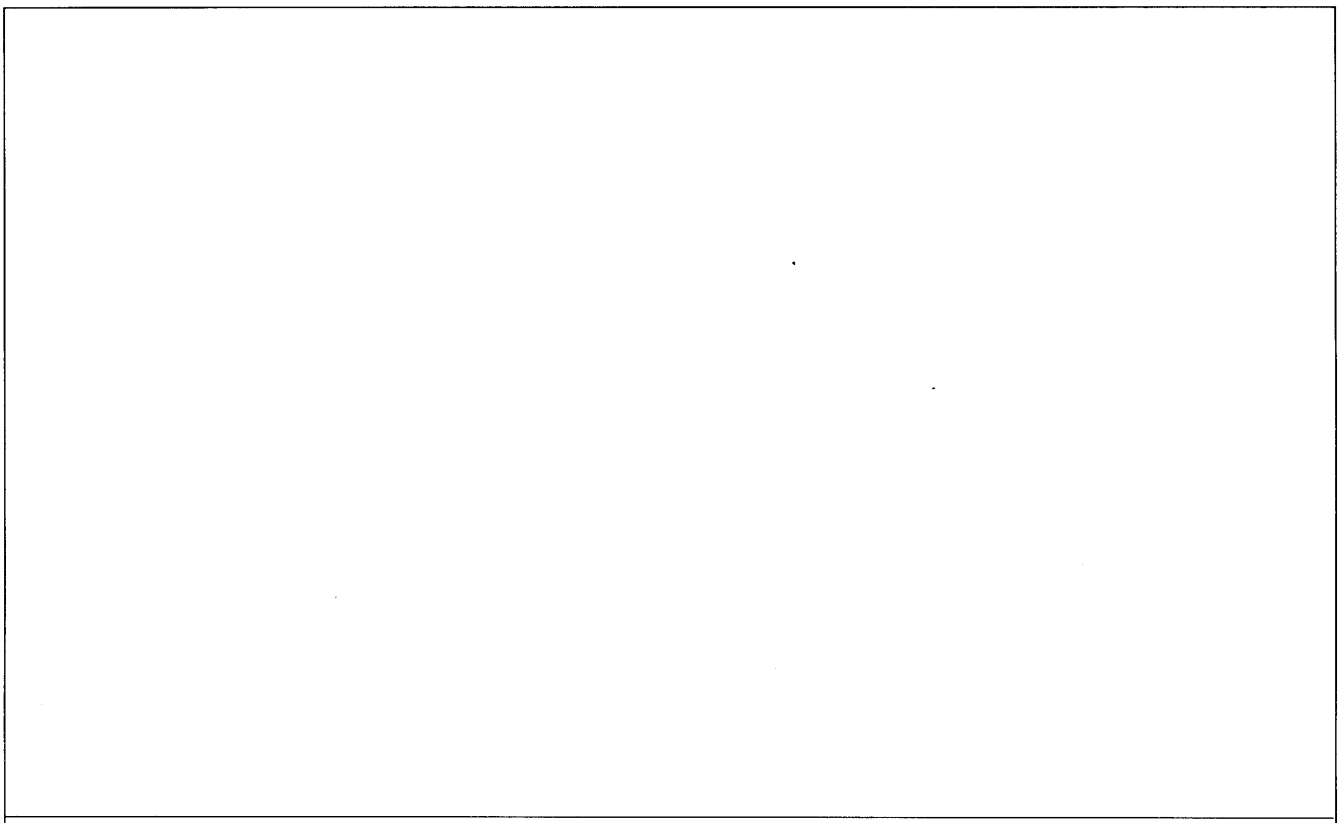
Citizens, EPA Work Together on Cleanup Plan

Radium research and processing facilities were prevalent in northern New Jersey from the early 1900s to the late 1920s. The processing facilities produced luminous paint for watch dials, surveying equipment, and airplane instruments, and later extracted the radium for research and medical applications. By the early 1930s, the effects of excessive exposure to radium were discovered, leading to closure of the processing facilities. While some materials remained at the facilities, various wastes such as sand tailings, coal ash, and bottles were disposed as fill for low-lying rural areas.

In 1979, NJDEP initiated a program to investigate areas previously used for radium processing facilities. In December 1980, Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authorizing the Superfund program. The following year, NJDEP requested that EPA conduct an aerial gamma radiation survey over a 12-square-mile area of Essex County. The aerial survey identified several residential areas with elevated gamma radiation levels. Ground investigations conducted in 1983 confirmed the presence of radium contamination.

Temporary Measures Frustrated by Limited Disposal Options

In May 1984, EPA and NJDEP jointly planned a pilot study to evaluate the feasibility of excavation and off-site disposal of the radium-contaminated soil. Twelve properties, with varying degrees of contamination, were selected for the pilot study, and preliminary engineering assessments were prepared. In the fall of 1984, EPA decided to forgo the pilot study since a full remedial investigation/feasibility study (RI/FS) had been initiated. NJDEP, however, decided to proceed with excavating the contaminated soil



Virginia Avenue looking south toward Samuel Street, circa 1913. *(Compare with photo on page 1.)*

and initiated a pilot program.

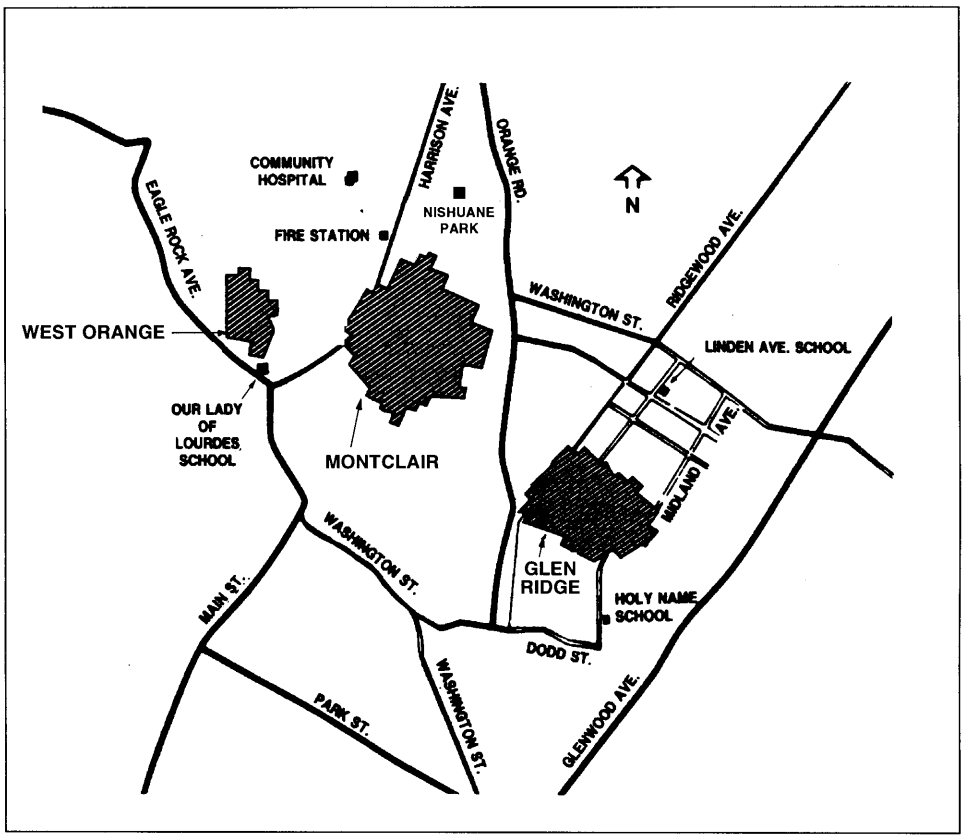
NJDEP began excavating in June 1985, after securing a disposal site for the contaminated soil by contracting with a commercial disposal facility in Nevada. Four properties in Glen Ridge had been completely remediated when Nevada revoked NJDEP's disposal permit. With no disposal facility available, NJDEP was forced to leave containerized soil at its transloading facility in Kearny, New Jersey and around partially excavated properties in Montclair.

NJDEP was able to remove the containers from Montclair in the fall of 1987, and in the summer of 1988 successfully disposed of the remainder of the soil stored at Kearny. The pilot program demonstrated that excavation of radium-contaminated soil was a feasible remedial action, but that transportation and subsequent disposal of the contaminated material made any excavation and off-site disposal alternative an extremely tenuous option.

EPA issued a draft RI/FS report in September, 1985 and announced a 60-day public review period. EPA then held a public meeting in November. At that meeting, it was noted that excavation of the radium-contaminated soil was the Agency's preferred approach for solving the problems at the sites, but the lack of a disposal facility prevented the selection of a remedy involving excavation with off-site disposal. The meeting was very well attended, with approximately half of the 1500 persons present unable to be accommodated in the meeting place. Even though EPA was not endorsing an on-site disposal option, the communities were adamantly opposed to any excavation, relocation, and consolidation of the radium-contaminated soil onto the original core areas of disposal in the Towns of Montclair and Glen Ridge.

The problems with identifying a viable disposal location, either in or out of state, combined with a potential for being prevented from using a site once it had been identified, as evidenced by NJDEP's earlier efforts, led to a decision to re-examine and search out additional remedies. EPA began a supplemental feasibility study in March 1987 to develop and evaluate measures to protect public health. As that study progressed, it became apparent that an evaluation of both interim and final remedial measures would need to be included.

EPA continued to investigate the sites, evaluating both long-term solutions, including excavation and disposal of the contaminated soil, and interim measures to solve the problems associated with the presence of the radium-contaminated soil. The results of these investigations were presented in a Supplemental Feasibility Study Report which was made available to the public in April, 1989.



Concurrent with the study, EPA released for public comment a proposed plan calling for excavation of soil from the most contaminated sites, installation of radon mitigation systems, and use of lead shielding for elevated gamma exposures. The remainder of the sites would receive partial excavation and/or institutional controls.

EPA held a public meeting in May, 1989 to present the proposed remedial plan. In addition, EPA held numerous public sessions to allow the local community to comment on EPA's proposal. The portion of the plan calling for full excavation received wide public support. There were strong objections from many members of the community to partial excavation and institutional controls. In general, the affected homeowners demanded that their properties be considered "clean" and free of any restrictions after remediation.

As a result of strong public opinion, and the recent identification of a viable disposal site, EPA issued the second set of records of decision (RODs) in June, 1990 calling for excavation and off-site disposal of contaminated material on each property where this material exceeded the cleanup criteria. EPA stated in the 1990 RODs that several factors could influence the implementability of the proposed remedy and the cleanup schedule. These factors included funding for the project and the long-term availability of a disposal site.

Determining Excavation Areas

Each property has unique characteristics requiring the extent of excavation to vary from a small area in a front or back yard to removal of contaminated soil on the entire property. Contaminated sidewalks, driveways, and patios have to be removed, then restored. In some cases, contaminated material was present below the foundation of the home.

Was Relocation Necessary?

The decision to temporarily relocate families was made

Virginia Avenue looking north toward Harrison Avenue, circa 1913. *(Compare with photo on page 1.)*

when utilities had to be disconnected, excavation was below the home's basement, or for accessibility. Depending on the extent of work, relocation took from a few weeks to 12 months. The U.S. Army Corps of Engineers handled the relocation activities, including leasing homes and apartments, renting furniture, and transferring personal belongings. Payment of utilities, cleaning, lawn maintenance, and snow removal was provided.

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Soil Removal in Concurrent Phases

To date, completed construction activities are approaching approximately 200 residential properties, and an additional 57 properties (Phase IV/V) are anticipated for remediation in the fall of 1995. In addition, approximately 100 families have been temporarily relocated and over 70,000 cubic yards of soil have been excavated.

The cleanup of Barrows Field in Glen Ridge will occur after initiation of work on the Phase IV/V properties. Please note that all 769 properties throughout the study areas need to complete verification testing. This testing includes a one-year radon test in each home. If you have any questions on this or would like more information about the sites, please contact the EPA Park Office at (201) 783-1765.

Phase	Properties	Status
Pilot Phase	15 Properties – Montclair Study Area	Cleanup Complete
Phase I	41 Properties – All Study Areas	Cleanup Complete
Phase IIA	26 Properties – Montclair Study Area	Cleanup Complete
Phase IIB	55 Properties –All Study Areas	Cleanup Complete
Phase III	56 Properties – Primarily in Montclair Study Area	Construction Ongoing
Phase IV/V	Approximately 57 Properties – All Study Areas	Contract Awarded
Barrows Field	Barrows Field – Glen Ridge Study Area	To Be Scheduled

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